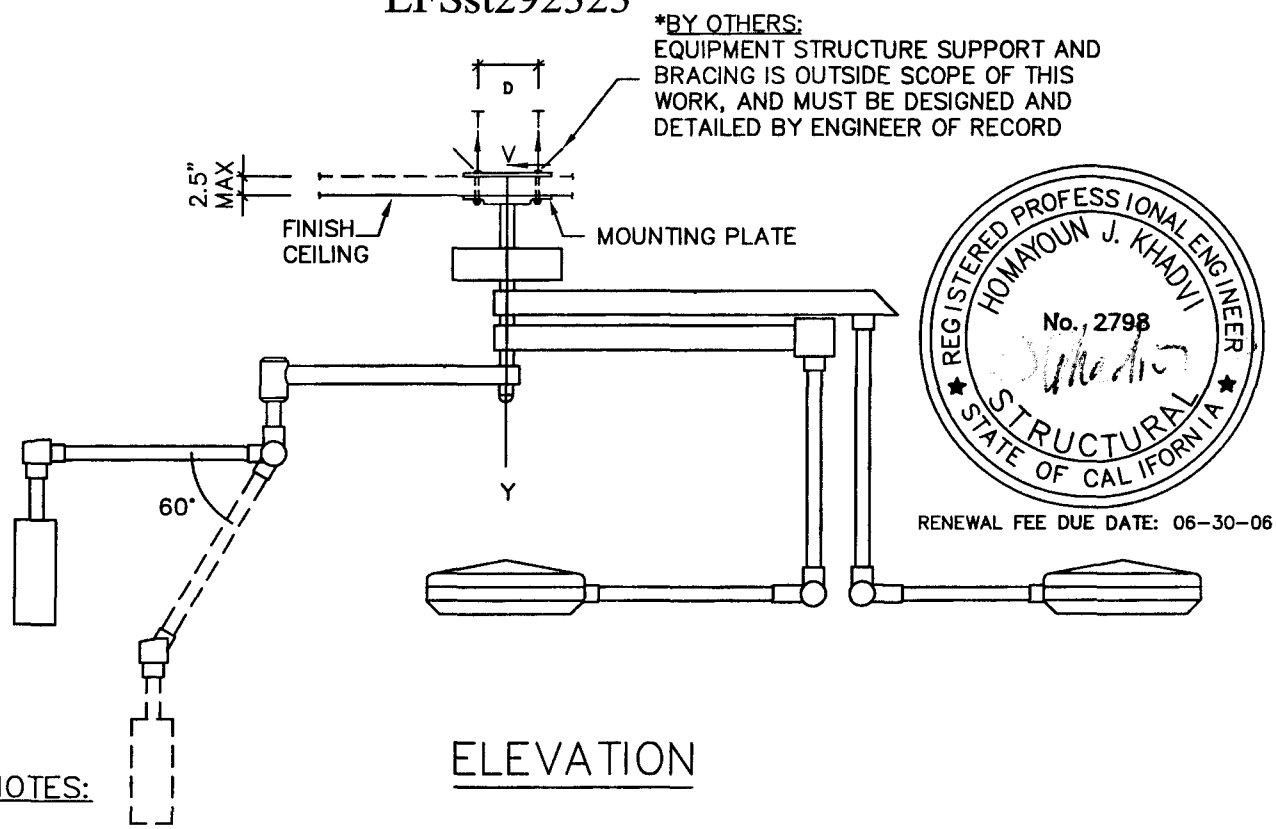
FIROUZI CONSULTING ENGINEER, INC.		
SKYTRON SURGICAL PRODUCTS	DES.	SHEET
LFSst292323 FOR SEISMIC ZONE (4), SOIL PROFILE (Sd) NEAR SOURCE FACTOR = 1.5	FCE JOB No. DATE: 4-6-04	1 OF 4 SHEETS

SEISMIC ANCHORING BOLT DESIGN

LFSst292323



ELEVATION

NOTES:

1. SCOPE OF WORK: DESIGN OF BOLTS CONNECTING MOUNTING PLATE TO STRUCTURE ONLY.
2. FORCES ARE DETERMINED PER 2001 CALIFORNIA BUILDING CODE – SECTION 1632A, (INCLUDING UP TO DATE REVISIONS) AND HAVE BEEN FACTORED TO REPRESENT WORKING DESIGN LOADS, NOT ULTIMATE
3. FORCES ARE MAXIMUMS AND OCCUR WHEN EQUIPMENT IS MOVED TO ITS MOST ECCENTRIC POSITION.
4. PROVIDE CEILING STRUCTURE DESIGNED AND DETAILS TO SUPPORT WEIGHTS AND FORCES SHOWN (BY ENGINEER OF RECORD FOR THE BUILDING)
5. ENGIINEER OF RECORD TO DESIGN, DETAIL AND VERIFY STRUCTURE AND/ OR EXISTING LIGHT SUPPORT TRACTS TO SUPPORT INDICATED LOADS
6. HORIZONTAL FORCES AND MOMENT MAY OCCUR IN ANY DIRECTION, ACTING AT THE TOP OF MOUNTING PLATE.

DESIGN CRITERIA:

FORMULA 32A-1: $F_P = 4.0\ Ca*Ip*Wp$

TABLE 16A-Q : $Ca = 0.44*Na = 0.44*1.5 = 0.66$ (For zone 4 & S_D)

TABLE 16A-K : Ia = 1.5 (For essential facility)

$\therefore F_P = (4.0)(0.66)(1.5)Wp = 3.96\ Wp$ (For LRFD)

$F_P = 3.96Wp/1.4 = 2.83Wp$ (For ASD)

FORMULA 30A-1: $E = p*E_h + E_v$

$E_h = F_P$

p = 1.0 (FOR COMPONENT)

$E_v = (0.5)Ca*Ip*Wp$

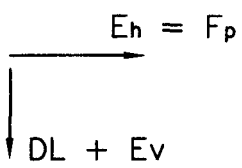
$= (0.5)(0.66)(1.5)Wp = 0.5Wp$ (For LRFD)

$= 0$ (For ASD)

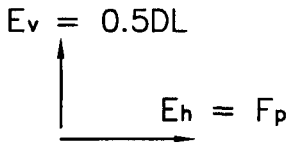
SECTION 1630A.11: $E_v = (0.7)Ca*I*Wp$

$= (0.7)(0.66)(1.5)/1.4 = 0.5Wp$ (For ASD) [NET UPLIFT FORCE]

LOAD COMBINATION CASE A



LOAD COMBINATION CASE B



BY COMPARISION LOAD, COMBINATION A GOVERNS

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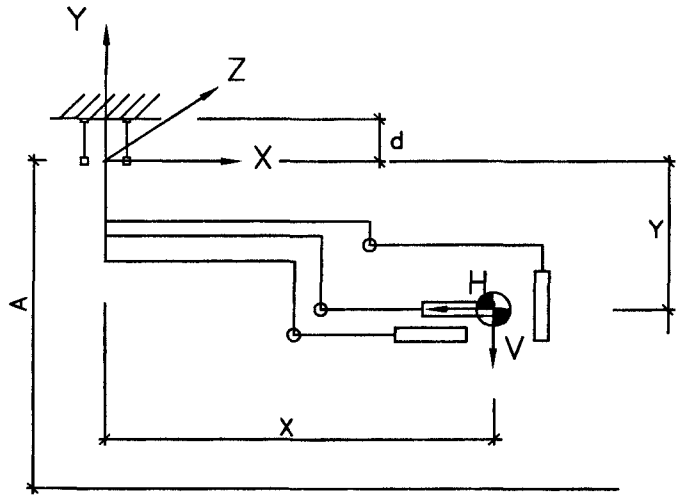
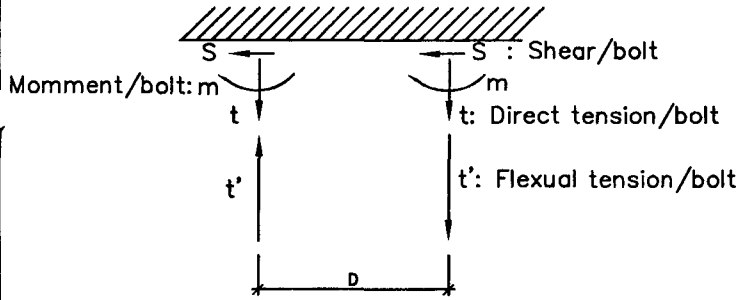
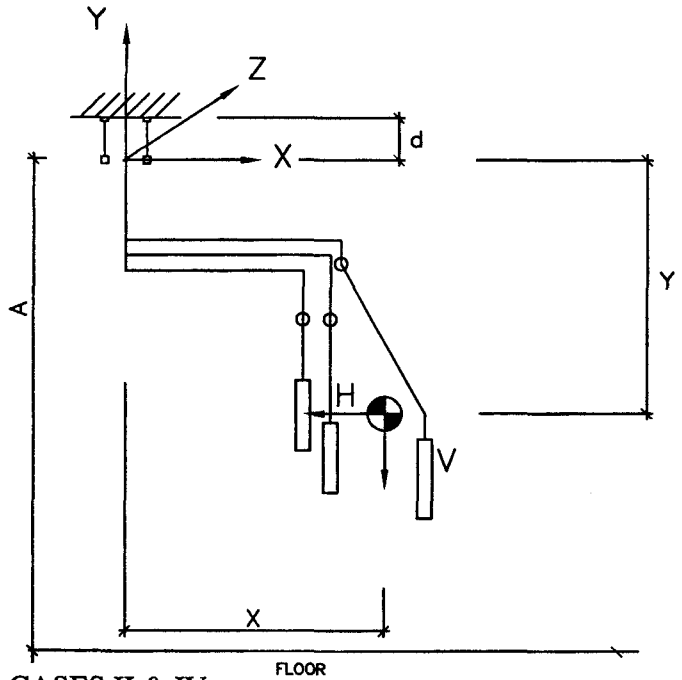


CASES I & III





CASES II & IV

A: MAX FLOOR TO MOUNTING PLATE DISTANCE
A = 10'-0" = 120"
Vd : Dead Load (= DL)
Ve : Vertical Seismic Load (= Ev)
He : Horizontal Seismic Load (= Eh)

CASE I (FIXTURE AT HIGH POSITION)

d = 2.5 "
D = 9.5 "
Vd = 135.0 + 120.0 + 100.0 + 100.0 = 455.0 #
Y = 120.0 - 80.0 = 40.0 "
X = (135.0 x 90.1 + 120.0 x 86.0 + 100.0 x 70.5 + 100.0 x 62.8)/ 455 = 78.7 "
Ve = 0.50 x 455.0 = 225.2 #
He = 2.83 x 455.0 = 1287.0 #
S = 1287.0 / 4.0 = 321.8 #
t = (455.0 + 225.2)/ 4 = 170 #
Total Mzz = (455.0 + 225.2)x 78.7 + 1287.0 x 40.0 = 105021 "#
t' = 105021 /(9.5 x 2) = 5527 #
m = 322 x 2.5 = 804.4 "#

CASE II (FIXTURE AT LOW POSITION)

d = 2.5 "
D = 9.5 "
Vd = 455.0 #
Y = [(120.0 - 34.6)x 135.0 +(40.0 + 43.0)x 120.0 +(40.0 + 35.3)x 100.0 +(40.0 + 35.3)x 100.0]/ 455.0 = 80.3 "
X = [(50.6 + 39.5 x COS(60))x 135.0 + 43.0 x 120.0 + 35.3 x 100.0 + 27.5 x 100.0]/ 455.0 = 46.0 "
Ve = 0.50 x 455.0 = 225.2 #
He = 2.83 x 455.0 = 1287.0 #
S = 1287.0 / 4.0 = 321.8 #
t = (455.0 + 225.2)/ 4 = 170 #
Total Mzz = (455.0 + 225.2)x 46.0 + 1287.0 x 80.3 = 134683 "#
t' = 134683 /(9.5 x 2) = 7089 #
m = 322 x 2.5 = 804 "#

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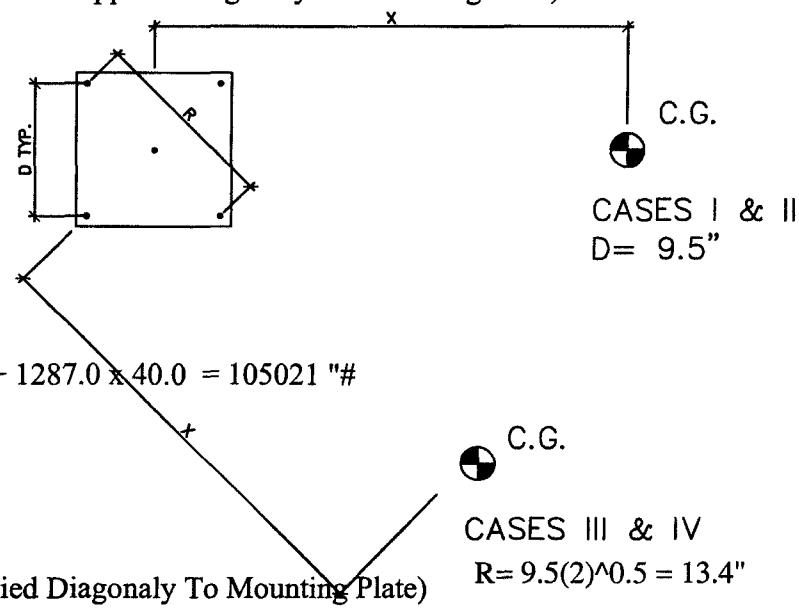
CASE III (Same As CASE I, Lateral Forces Applied Diagonaly To Mounting Plate)



d = 2.5 "
D = 13.4 "
Vd = 455.0 #
Y = 40.0 "
X = 78.7 "
Ve = 0.50 x 455.0 = 225.2 #
He = 2.83 x 455.0 = 1287.0 #
S = 1287.0 / 4.0 = 321.8 #
t = (455.0 + 225.2)/ 4 = 170 #
Total Mzz = (455.0 + 225.2)x 78.7 + 1287.0 x 40.0 = 105021 "#
t' = 105021 /(13.4 x 1) = 7817 #
m = 322 x 2.5 = 804 "#

CASE IV
(Same As CASE II, Lateral Forces Applied Diagonaly To Mounting Plate)

d = 2.5 "
D = 13.4 "
Vd = 455.0 #
Y = 80.3 "
X = 46.0 "
Ve = 0.50 x 455.0 = 225.2 #
He = 2.83 x 455.0 = 1287.0 #
S = 1287.0 / 4.0 = 321.8 #
t = (455.0 + 225.2)/ 4 = 170 #
Total Mzz = (455.0 + 225.2)x 46.0 + 1287.0 x 80.3 = 134683 "#
t' = 134683 /(13.4 x 1) = 10025 # GOVERNS
m = 322 x 2.5 = 804 "#

CHECK 7/8" DIA. A490 BOLTS:

ALLOWABLE TENSION: 32500 #
ALLOWABLE SHEAR: 12600 #

S = 3.14*d^3/32 = 3.14 x(0.88)^3/ 32.0 = 0.07 "3
fb = 804.4 / 0.07 = 12236 PSI
Fb = 0.75 x 36000 = 27000 PSI

fv/Fv + ft/Ft + fb/Fb = 0.03 + 0.31 + 0.45 = 0.79 <1.0 OK

USE 7/8" DIA. A490 BOLTS